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derived from (3) will contain two arbitrary constants, which appears to be more in accordance with the recent experiments of MM. Wertheim, Strehlke, and Kirchhoff, than the original result of M. Navier, which makes the equations of a homogeneous solid depend upon a single constant. If in function (3) *G*, *H*, &c., be constants, the linear part of the function will produce no terms in the equations of motion, which will become identical with the equations given by M. Cauchy for a system of attracting and repelling molecules, when we do not suppose the natural condition to be one of free equilibrium."*

Mr. Donovan read a notice of the analysis of certain gold-coloured bronze antiquities found at Dowris, near Parsonstown, in the King's County.

"At a late meeting of the Academy a communication was made by Thomas L. Cooke, Esq., of Parsonstown, relative to certain ancient bronze articles found at Dowris in the King's County. Some specimens having been, by that gentleman, placed in my hands for analysis, I deem it proper to lay before the Academy the results of my investigation. The articles given to me were part of a celt and a portion of a horn.

"The golden hue of these ancient bronzes suggested to some persons the idea that they contained an admixture of zinc, an ingredient not hitherto, I believe, found to enter into their composition. Such bronzes in the British Museum as have been analysed consist of copper and tin only; and the Greek and Roman bronze coins are known to have been composed of the same metals. Bishop Watson, it is true, supposed that zinc constituted a part of a celt examined by him, his proof being that the metal, when melted, emitted a thick, white smoke, accompanied by a blue flame, which are esteemed, he says, certain marks of zinc. This may possibly have been the case in Bishop Watson's particular specimen, but the celts examined by other chemists proved destitute of zinc, and its introduction into the ancient bronzes must have been a very rare practice. Zinc would no doubt enhance the colour, and increase the malleability of the compound, but it would lessen its hardness, one of the chief qualities for which the metal was valued. Add to this, the test assigned of the presence of zinc is equivocal. Dr. Pearson observed a fume, to a small amount, when portions of an ancient bronze, which he proved not to contain zinc, were strongly heated; and he quotes the statements of certain assayers, who observed fumes to arise from charges of lead with silver, or lead with gold and silver, when much air is admitted. He also says that 'if much air be admitted to the alloy of copper with tin in fusion, a white smoke will sometimes be seen.'

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* Exercices de Mathematiques, vol. iv. p. 131.

"The specific gravity of the celt was 8·767, an indication of the presence of tin, and of the absence of zinc; but to determine the question the following process was adopted:

"A portion of the metal was dissolved by heat in nitric acid; a white powder separated, which, being edulcorated, dried, and mixed with borax and incinerated pitch, was exposed to the heat of a Russian furnace. The black mass obtained from the crucible, when viewed with a strong magnifier, disclosed thousands of metallic particles disseminated through it. By pulverizing and washing this matter, I obtained a portion of the metal: its solution in muriatic acid, mixed with a small quantity of nitric acid, afforded those appearances with solution of gold which indicate tin. The nitric solution of the celt, from which tin had been thus separated, was subjected to the action of a bright plate of lead immersed in it; the whole of the copper was thus precipitated, as was proved by the test of ammonia. The filtered liquor, now deprived of copper and tin, was mixed with solution of sulphate of soda, and boiled down to a small bulk. The sulphate of lead being filtered off, solution of potash was added, but no oxide of zinc appeared.

" Thus it was proved that the celt did not contain zinc; other trials, however, showed that it contained a little lead. In order to determine the proportions of the constituent metals, the following method was adopted: I believe it is one which differs in some respects from that hitherto practised, but previous trials convinced me that in such cases it is necessary.

" 100 grains of celt metal were introduced into a tubulated retort, to which were attached a receiver, and a series of three very small Woulfe's bottles, each of which contained a little liquid ammonia ; the receiver was empty. An ounce and a-half measure of pure nitric acid being poured through the tubulature of the retort, and a spirit lamp applied, a violent effervescence ensued ; everything dissolved except the tin, which became peroxidated. Some acid and much nitrous gas came over, the latter of which passed through the ammonia. When the celt metal had all disappeared, the contents of the Woulfe's bottles were mixed with those of the receiver; the resulting liquor was of a light blue colour, for the nitrous gas had carried over with it some copper; it was reserved for a future process.

" The solution of nitrate of copper was diluted with distilled water, and introduced into a precipitating glass, in order that the peroxide of tin should subside. When this happened, the perfectly transparent solution of copper was decanted, and the peroxide of tin was digested with a little nitric acid, in order to dissolve away minute particles of copper, which sometimes escape solution by being entangled in the peroxide of tin. The peroxide was then well edulcorated with frequent affusions of distilled water. The collected washings were evaporated to one-eighth, and a minute quantity of peroxide of tin was thus recovered, which was added to the rest. By proper management the peroxide was drained to the last drop, dried on the capsule, collected with great care on glazed hot paper, and thence transferred to a bulbed tube of Bohemian glass, without the smallest loss. The bulbed tube had been previously heated, and counterpoised in the scale-pan of the balance. The bulb was then gradually heated until the peroxide was red-hot; the weight of the peroxide of tin was 16·678 grains, equivalent, according to the estimate of Berzelius, to 13·112 grains of metallic tin. This mode of determining the quantity of peroxide of tin I found much better than filtering and burning the filter.

" In order to discover the quantity of lead, pure sulphate of soda, in quantity known to be more than sufficient, was added to the solution of nitrate of copper. No precipitate ensued. The whole was introduced into a retort, a receiver was attached, and the acidulous water was distilled off. The process required the greatest vigilance, for the least increase of heat towards the end caused the liquid to sputter and shoot out particles in all directions, a circumstance which had imposed on me the necessity of abandoning a former analysis of this celt. At length the nitrate of copper showed a tendency to solidify, the heat was then raised until nitrous gas began to appear. The heat being withdrawn, some distilled water was added, which dissolved the nitrate of copper, but left a small quantity of sulphate of lead. This, being washed with frequent small portions of distilled water, was separated in the same manner as the peroxide of tin had been, and heated to an obscure red. Before it had cooled entirely it was ascertained to weigh 1·75 grain, which, according to the estimate of Berzelius, indicated 1·142 grain of metallic lead.

" The next step was to ascertain the quantity of copper. The washings of the sulphate of lead were added to the solution of nitrate of copper; the whole was distilled in a retort, with the same precautions as before, until the nitrate showed a tendency to solidify. At this period I connected the same series of Woulfe's bottles, still containing the ammonia, which had been used for condensing the nitrous vapour, and which also held a little copper dissolved. Through this ammonia the nitrous gas evolved from the nitrate of copper, now undergoing decomposition in the retort, was obliged to pass, previously to its emission into the atmosphere, in its passage transferring to the ammonia the chief part of the copper which it had carried over. The heat was gradually raised, and continued until the nitrate of copper was converted into a black mass.

"I have mentioned that the *chief part* of the volatilized copper was detained by the ammonia, but it was not entirely absorbed, for, at the latter end of the decomposition of the nitrate of copper, the flame of a spirit lamp, held in the fumes which escaped from the issue-tube of the Woulfe's bottles, assumed a splendid green colour. The loss in this way must be trivial.

"The bottom of the retort which contained the black mass was now cut out by means of a red-hot tobacco pipe, and the black matter detached from the glass. But so obstinately did a very small portion adhere, that it could only be removed by nitric acid; the nitrate thus formed was decomposed by heat, and the resulting black matter was added to the main product.

"In order to recover the copper which was contained in the Woulfe's bottles and receiver, the liquors were collected and distilled to a very small bulk. The distilled liquor was colourless, and, therefore, contained no copper. The residue, being transferred into a capsule, was decomposed by heat, and the very small quantity of black matter which resulted was added to the main product.

"The total quantity of black matter was now heated red-hot, by means of a Russian furnace, for about five minutes. Before it cooled, its weight was ascertained to be 106·767 grains, equivalent, according to the estimate of Berzelius, to 85·232 grains of metallic copper.

" In another analysis of the same celt, I confirmed the foregoing result by a different proceeding, which was as follows: 100 grains of the metal having been dissolved in nitric acid, and freed from tin and lead as before, the solution of nitrate of copper was precipitated by an excess of pure potash. By boiling the mixture, the peroxide of copper resulted, and this was boiled with repeated affusions of distilled water. The washings were evaporated to a small quantity, and thus a little more peroxide of copper was obtained. The whole product was filtered and dried. The filter was carefully burned on a saucer, the peroxide was heated red-hot for five minutes, and, after deducting the known weight of the ashes of the filter, the weight of the peroxide was ascertained to be 0·41 less than by the former method; but I rely more on the former estimate.

" Directed by some preliminary experiments on the celt metal, I dissolved 100 grains in two ounces by measure of pure muriatic acid, mixed with one-eighth of pure nitric acid, over a lamp-heat. A black powder was separated, which, when dried and thrown on a plate of platinum, maintained at a red heat over a spirit-lamp, burned with the characteristic blue flame of sulphur, in the midst of which could be discovered a few sparkles of burning charcoal. The sulphur had not been discovered in the former analysis, because the nitric acid being concentrated acidified it. The weight of this black powder was but 0·15 grain. Although I sought for traces of gold under the supposition that the celt might have been gilt, as some persons supposed, I could not obtain any distinct evidence of the presence of that metal.

" I next proceeded to the analysis of the horn, and conducted it with the same care. It is unnecessary to say anything more on the subject than to state the result of the two analyses. The celt consisted of—

Copper,	85·232
Tin,	13·112
Lead,	1·142
Sulphur and Carbon,	0·150
	99·636
Loss,	·364
	100

And the horn consisted of

Copper,	79·345
Tin,	10·873
Lead,	9·115
	99·333
Loss,	·667
	100

" The loss in both cases may be partly accounted for by the escape of copper in the nitrous gas, as already mentioned, which it was not in my power to prevent. The ratio of lead in the celt is so small that advantage to the properties of the alloy could scarcely be derived from it, yet it is too great to suppose that the lead was a mere impurity of the copper. I believe antiquarians are not agreed with regard to the purpose to which celts were applied. Whatever it was, the composition of that one examined by me was admirably calculated for fabricating weapons. The metal admitted of a fine polish, and was then of a beautiful colour. Its toughness was so great that it was capable of sustaining the fiercest encounter without fracture; while its edge, by the mere process of hammering, became so hard and keen that it would cut not only through flesh but bone. It was a matter of great interest to me to discover the skilful proportions of the constituent metals, which, in times of remote antiquity, our ancestors employed in order to combine beauty with utility, and both of these objects they appear to have fully accomplished.

" In conclusion, I have to observe, that as the results of my analyses differ more or less from others which have been stated by chemists, I have been thus particular in detailing my methods. The difference of our results only proves the variety of proportions in which ancient manufacturers manipulated.

" The balance employed in these analyses turns very perceptibly with the thousandth part of a grain weight."

Professor Allman read a memoir on the Natural History of the genus *Alcyonella.*

This memoir he proposed dividing under three heads. The first was intended to embrace the *literary* history of the genus, and to contain an enumeration of the several authors who have in any way advanced our knowledge of it, with a short analysis of the various memoirs in which it is treated. The second head was to be devoted to its *zoology,* properly so called, and to contain a description of the external characters, with the diagnosis of species and synonymy. In the third it was proposed to give a detailed account of its *anatomy* and *embryology.*

It was in the month of April, 1741, that Trembley, in the course of his celebrated researches in the history of the hydra, discovered in the fresh waters near La Haye, an animal form then quite new to science. It consisted of a lobed jelly-like mass, from which protruded numerous polypoid bodies, characterized by the possession of an elegant crown of tentacula, borne upon the margin of a crescent-shaped disk. This beautiful tentacular plume is one of the most striking features in the animal, and at once suggested the name of *Polype à panache,* bestowed on it by its discoverer.

The same zeal and fidelity of observation which had marked all the previous labours of Trembley were now brought to bear upon the investigation of this new animal; and by thus making us acquainted with a very remarkable type of struc-